USDA Service Center Agencies
Geospatial Data Management Team
Data Management Plan For

Hydro Unit-Watershed Boundary Data

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I. Purpose and Scope (business case)

A. Purpose

The intent of defining hydrologic units (HU) for the Watershed Boundary Dataset is to establish a base-line drainage boundary framework, accounting for all land and surface areas and to create a national, consistent, seamless, and hierarchical watershed boundary dataset based on topographic and hydrologic features across the country. The hydrologic unit boundaries in this dataset define the extent of surface water drainage to a specified point. The selection and delineation of hydrologic boundaries are determined solely upon science-based hydrologic principles, not favoring any administrative or special projects nor particular program or agency.

The database will assist in planning and describing water use and related land use activities.

B. Scope

This dataset is being delineated and geo-referenced to the USGS 1:24,000 scale topographic base map meeting National Map Accuracy Standards (NMAS). A hydrologic unit has a single flow outlet except in coastal or lakefront areas as stated by the Federal Standard for Delineation of Hydrologic Unit Boundaries. The map extent is typically a hydrologic unit.

 The Watershed Boundary Dataset is being developed under the leadership of the Subcommittee on Spatial Water Data, which is part of the Advisory Committee on Water Information (ACWI) and the Federal Geographic Data Committee (FGDC). The USDA Natural Resources Conservation Service (NRCS), along with many other federal agencies and national associations, have representatives on the Subcommittee on Spatial Water Data.

 As watershed boundary geographic information systems (GIS) coverage's are completed, statewide and national data layers will be made available via the Geospatial Data Gateway to everyone, including federal, state, local government agencies, researchers, private companies, utilities, environmental groups, and concerned citizens.

II. Acquisition

A. Data Source
1. Producer Information
   a. Name

The Natural Resources Conservation Service (NRCS) State Offices, following national delineation and digitizing guidelines, are producing the 2-12-digit hydrologic unit coverages. In many cases, state and other federal partners are involved. NRCS' National Cartography and Geospatial Center is certifying completed coverages.

b. Location of Headquarters

NRCS State Office for the state of coverage

c. Internet Address

http://state.nrcs.usda.gov where *state* is replaced with the 2-letter abbreviation of the state of coverage

2. Publisher Information

a. Name

Each state will publish their 2-12-digit HU data on their NRCS state home page and/or on the state's spatial data clearinghouse. In addition, the Natural Resources Conservation Service's National Cartography and Geospatial Center will publish certified data.

b. Location of Headquarters

Natural Resources Conservation Service
National Cartography and Geospatial Center
P. O. 6567
501 Felix St., Bldg. 23
Fort Worth, TX 76115-3405

c. Internet Address

http://www.ncgc.nrcs.usda.gov

3. Acquisition Information

a. Delivery Media

Certified data is available by request from:

Natural Resources Conservation Service
National Cartography and Geospatial Center
P. O. 6567
501 Felix St., Bldg. 23
Fort Worth, TX 76115-3405

b. Download URL

Certified data is available from the USDA Geospatial Data Gateway
http://datagateway.nrcs.usda.gov/GatewayHome.html

c. Projected Data Availability Schedule

National status map is available at:
 http://www.ncgc.nrcs.usda.gov/branch/gdb/products/watershed/index.html

B. Standards Information
1. Geospatial Data Standard
a. Standard Name and Steward Information

Standards and instructions for the development and certification of the WBD can be found at:
http://www.ncgc.nrcs.usda.gov/branch/gdb/products/watershed/index.html

United States Department of Agriculture (USDA) Service Center Agencies (SCA) Standard for Geospatial Data

b. Standard Version

SCI Std 003-02
October 15, 2003

c. Standard URL

http://www.itc.nrcs.usda.gov/scdm/docs/SPG-GeospatialDataStandard.pdf

2. Metadata Standard
a. Standard Name and Steward Information

Metadata are compliant with:
Federal Geographic Data Committee (FGDC)
Content Standard for Digital Geographic Metadata FGDC
STD-001-1998 Version 2 revised June 1998

And:
United States Department of Agriculture (USDA) Service Center Agencies (SCA) Standard for Geospatial Dataset Metadata
SCI Std 003-02 October 15, 2003

http://www.itc.nrcs.usda.gov/scdm/docs/SPG-GeospatialDatasetFileMetadata.pdf

b. Description of Metadata Captured

Metadata for the WBD is at data-set level implementation and will not be in place until file-specific information for individual maps is available.
http://www.ncgc.nrcs.usda.gov/branch/gdb/products/watershed/index.html

c. Metadata Accuracy and Completeness Assessment

None

C. Acquired Data Structure
1. Geospatial Data Format
a. Format (raster, vector, etc.)

Vector.

b. Format name

Data will be acquired as ESRI shape files, ARC/INFO coverages, and ARC/INFO exchange files.

c. Data Extent

The data extent is statewide for each state or by hydrologic unit region and sub-basin. Currently, a national coverage is being developed.

A current status graphic of data development may be viewed at:
http://www.ncgc.nrcs.usda.gov/branch/gdb/products/watershed/index.html

d. Horizontal and Vertical Resolution

Horizontal resolution is the same as 7.5-Minute USGS Quadrangle.

Vertical resolution is not measured.

e. Absolute Horizontal and Vertical Accuracy

7.5-Minute USGS Quadrangle Accuracy

Horizontal positional accuracy is based upon the use of USGS source quadrangles, which are compiled to meet National Map Accuracy Standards (NMAS). NMAS horizontal accuracy requires at least 90 percent of points tested are within 0.02 inches of the true position. The digital data are estimated to contain a horizontal positional error of less than or equal to 0.003 inches standard error in the two component directions relative to the source quadrangle.

Vertical positional accuracy is not measured.

f. Nominal Scale

1:24,000

g. Horizontal and Vertical Datum

The reference data may be North American Datum of 1927 (NAD 27), North American Datum of 1983, (NAD 83), Old Hawaiian Datum (OHD), or Puerto Rico Datum (PRD) of 1940. Completed data will be projected to NAD83.

h. Projection

Geographic

i. Coordinate Units

Decimal Degrees

j. Average Data Set Size

Depending upon the size of the state, it is estimated that the average will be about 40mg.

k. Symbology

None

2. Data Model
    a.   Geospatial Data Structure

       The WBD consists of polygons and lines in a seamless, consistent, nested dataset for the nation. The layer will be delineated for 1st-6th levels of hydrologic units (2 through 12 digits).

    b.   Attribute Data Structure

       Varies depending on whether source is shape file, coverage or exchange file.

    c.   Database Table Definition

       Varies depending on whether source is shape file, coverage or exchange file.

    d.   Data Relationship Definition

       Varies depending on whether source is shape file, coverage or exchange file.

    e.   Data Dictionary

       Appendix of Interagency document Federal Standards for Delineation of Hydrologic Unit Boundaries.
       http://www.ncgc.nrcs.usda.gov/branch/gdb/products/watershed/index.html

D. Policies
1. Restrictions
    a.   Use Constraints

       None

    b.   Access Constraints

       None

    c.   Certification Issues

       None

2. Maintenance
    a.   Temporal Information

       Range of Dates/Times:
       Beginning Date: 1979-2007
       Ending Date: present

    b.   Average Update Cycle

       As needed

E. Acquisition Cost
1. Cooperative Agreement
    a.   Description of Agreement

None

    b.   Status of Agreement

None

  2. Cost to Acquire Data

None

III.   Integration

A. Value Added Process
1. Benefit to the Service Center

Integration will allow service centers to consider all landscape within their service center area in the context "watersheds", including those completely in the service area and those flowing into or out of the service area. "Watersheds" are useful for ecological context areas for water quality assessments.

2. Process Model
    a.   Flow Diagram

Steps to create the Watershed Boundary Dataset (WBD) 6-30-03

1. Mapjoin certified state datasets, fix edge matching problems, and attributes betweens states. (This step is very time consuming due to the many problems between states.)
2. Run wbdstep2 .amyl to create all the attribute fields and create a sub basin national coverage and sub watershed national coverage.
3. Dissolve sub basin using HUC_2 attribute field in ArcView/ArcMAP, create region coverage in ArcView or ArcMap. Can't do this step in Arc command line due to the need for only one record per HU region.
4. Dissolve sub watershed coverage using HUC_8 attribute field in ArcView/ArcMAP and create sub basin coverage. Can't do this step in Arc command line due to the need for only one record per HU sub basin.
5. Run fips and MBR scripts and add these fields to the dissolved region and sub basin coverages. Use county map for sub basin coverage and state map for region coverage (can't use county map for region since fips_c field can only be 255 characters, not wide enough field to use county map on region coverage).
6. Join the fips and MBR fields to the fully attributed sub basin and sub watershed coverages. If joining fips and MBR in Arc, need to convert region and sub basin fips/MBR shapefiles to coverages. This step can be done in ArcView/ArcMap in a round-about way. Drop unwanted fields left over from the joinitems command.
7. Run the wbd_sub or regline aml to do the relation between the polygons and lines in the sub basin and sub watershed coverages. This aml create a relate table that uses a cursor to copy unique fips codes for left and right polygons per each line and attributes a new fips field in the line attribute table.
8. Run *frequency* in arc for sub basin (use huc_2 field) and sub watershed (use huc_8 field) coverages. The output info file for each coverage is used to determine unique values from huc_2 and huc_8 fields which will be used to dissolve individual coverages for each of the listed HUC codes. These unique coverages will be used by the Gateway to determine the size of the delivered product and to run footprint script.

9. In Arc, run *infodbase* on frequency info files to create dbf files for editing. Using Excel, delete all fields except for the unique code fields; remove the header from this field. Export these unique codes to a .txt file.

10. In Arc, run *wbdstep3.aml* using frequency .txt file to create individual shapefiles for each region and sub basin. These files should be written to /iti01/arena8/huc/wbd_gateway/region or sub basin.

11. Run footprint script using dissolved region and sub basin shapefiles on the newly created individual region and shapefiles. This step creates the two footprints for the gateway. Put index maps for region and sub basin into ims2 index folder.

12. Load the sub basin and sub watershed coverages into SDE using ArcCatalog. In SDE, their should be four feature classes under GDB.wbd_huc12. Load the polygon sub basin and sub watershed as polygon databases and the lines from these two coverages as line databases. During loading in ArcCatalog, specify which fields not to load so they are not delivered from Gateway.

13. Create state folder under NCGC ftp site with state postal abbreviation – ftp/pub/hu/wbd_docs/. In this folder put state metadata, any extra documents provided by the state, and state attributes if any as a .dbf file with the huc_12 code as a relate item.

14. Update the /iti01/arena8/huc/wbd_gateway/wbddocs/watershed_boundary_dataset_state_documents.doc file to include an html link for the new state's folder created in step 13.

15. For Gateway- load the .dbfs from footprints/fpdest into countyZoneMBrs so the data services know of the new maps

16. For Gateway - update the Gateway Catalog database with the new catalogs

    b. Process Description

- Obtain the data from the approved source
- Overlay the data on the Service Center Area
- Identify all subwatersheds coincident
- Include areas outside the Service Center when the areas flow into or out of the Service Center.
- Produce file of appropriate subwatershed features and attributes for the Service Center.

3. Technical Issues

    a. Tiling

Seamless dataset.

    b. Compression

None

    c. Scale

The data are appropriate for use at 1:24,000.

    d. Tonal Matching

None

    e. Edge-matching

State coverages are edge matched from the 1:24,000-scale source material to a statewide coverage. Edgematching is accomplished across state lines to the degree possible. Eventually, a national seamless dataset will be made.

4. Quality Control

    a.   Procedures

Quality control procedures are described in the Federal Standards for Delineation of Hydrologic Unit Boundaries.

    b.   Acceptance Criteria

Data meet National Map Accuracy at 1:24,000 and were developed and attributed as per the Federal Standards for Delineation of Hydrologic Unit Boundaries.

5. Data Steward

    a.   Name and Organization

For Archiving and distribution
National Cartography and Geospatial Center
Natural Resources Conservation Service
US Department of Agriculture
501 Felix Street, Building 23
P. O. Box 6567
Fort Worth, Texas 76115-0567 **USA**

The originating state office is the steward for maintenance, updating and changing archived copy.

    b.   Responsibilities

Makes any revision to the data set and notifies National Cartography and Geospatial Center.

B. Integrated Data Structure

1. Geospatial Data Format

    a.   Format (raster, vector, etc.)

Vector

    b.   Format Name

ESRI shape file

    c.   Data Extent

Service Center Area, with overedge for watersheds flowing into or out of the service area.

    d.   Horizontal and Vertical Resolution

Same as source data.

    e.   Absolute Horizontal and Vertical Accuracy

Same as source data.

f. Nominal Scale

Same as source data.

g. Horizontal and Vertical Datum

The datum is North American Datum 1983 for all appropriate areas (UTM zone 3 through 22) and World Geodetic System 1984 elsewhere. The vertical datum is mean sea level

h. Projection

Geographic.

i. Coordinate Units

Decimal Degrees

j. Symbology

None

2. Attribute Data Format

a. Format Name

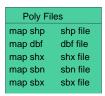Dbase IV, as part of an ESRI shape file.

b. Database Size

Depends on extent

3. Data Model

a. Geospatial Data Structure

Poly Files	
map shp	shp file
map dbf	dbf file
map shx	shx file
map sbn	sbn file
map sbx	sbx file

b. Attribute Data Structure

Dbase IV files as associated with shape files. All attributes are character except that the area value is numeric.

c. Database Table Definition

Each level (1-6) of the WBD will have the same attribute fields with the 2-digit code to identify the level. For example, the hydrologic unit name field for sub-basins is called "hu_8_name".

Field Name	Example	Description
* Hydrologic unit code	010802010308	Unique identifier for each hydrologic unit
* Acres	26739	Acres calculated from the area field
* States	KS, MO, OK	State(s) that the hydrologic unit resides
* Non-contributing area outlet of the hydrologic unit	357	Drainage areas that do not contribute to the
* Downstream HU from the hydrologic unit	010801010309	hydrologic unit that is receiving the flow
* Hydrologic unit name the interagency guidelines	Upper Blue River	Officially recognized names as specified in
* HU Modification affect location of the HU boundary	CD, LE, IT	Any modification(s) of overland flow that
* Hydrologic unit type identifies the drainage form	S	Hydrologic unit type that most closely

    d.   Data Relationship Definition

        Standard .dbf file that goes with shape file.

    e.   Data Dictionary

        In Appendix
        http://www.ncgc.nrcs.usda.gov/branch/gdb/products/watershed/index.html

C. Resource Requirements
1. Hardware and Software

Refer to the Common Computing Environment (CCE).

www.sci.usda.gov

2. Staffing

This is unknown at this time.

D. Integration Cost
1. Hardware and Software

To reformat, reproject, and subset the dataset a minimum the following is required:
ArcGIS
Arc/Info on UNIX or NT platform
ArcView on XP platform

2. Staffing

This is unknown at this time.

IV. Delivery

A. Specifications

1. Directory Structure

   a.   Folder Theme Data is Stored In

      F:\geodata\ hydrologic_units

      http://www.itc.nrcs.usda.gov/scdm/docs/SPG-GeospatialDataSetFileNamingStandard.pdf

2. File Naming Convention

      http://www.itc.nrcs.usda.gov/scdm/docs/SPG-GeospatialDataSetFileNamingStandard.pdf

   a.   List of Theme Files and The File Naming Convention

Areas shown at the 8-digit level by region at 1:250K:	huc250k_a_<xx>
Lines shown at the 8-digit level by region:	wbdhu8_l_<xx>
Areas shown at the 8-digit level by region:	wbdhu8_a_<xx>
Lines shown at the 12-digit level by sub-basin:	wbdhu12_l_<xxxxxxxx>
Areas shown at the 12-digit level by sub-basin:	wbdhu12_a_<xxxxxxxx>

      <xx>   hydrologic region number
      <xxxxxxxx> hydrologic sub-basin number

B. User Information

1. Accuracy Assessment

   a.   Alignment with Other Theme Geospatial Data

      The data are captured at a scale of 1:24,000 and are intended for use 1:24,000 or smaller scales.

   b.   Content

      Data are sufficiently detailed for use at 1:24,000 or smaller scale.

2. Appropriate Uses of the Geospatial Data

   a.   Display Scale

      1:24,000 or smaller

   b.   Plot Scale

      1:24,000 or smaller

   c.   Area Calculations

      As accurate as the source data and capture scale and the algorithm used by ArcGIS, ArcInfo/ArcView.

   d.   Decision Making

      None

C. Maintenance and Updating
1. Recommendations and Guidelines

a. Original data location and structure

The original WBD layer for distribution will reside in the Geodata Warehouse (GDW). At SCA field offices a working copy will be placed in **F:\geodata\hydrologic_units** with the standard naming convention. It should be in ArcView shape file format until other formats are needed.

b. Update Cycle

Certified datasets will be updated at the national level on an annual basis with coordination thru the national WBD dataset manager. Newly certified WBD state datasets will be posted immediately upon certification. Update issues arising during the year will be logged with the State WBD dataset manager, who upon validation will notify the national WBD dataset manager for posting to the national inventory and GDW during the next update cycle.

c. Availability

The complete layer will be made available to anyone thru the GDW. State WDB contacts and the state FAC Geodata sub-committees will determine what part of the layer will need to be downloaded from the GDW for each service center and application in the state. An automatic refresh utility to update SCA datasets has not been developed at this time.

d. Change Control

As new WBD data are refreshed on SCA systems and other agency servers, previous versions should be moved to an archive folder and renamed to wbdhu8_l <xx>av1, wbdhu8_a <xx>av1, wbdhu12_l <xx>av1, wbdhu12_a <xx>av1 (av1 stands for archived version 1, 2, etc..). There should be no more than two previous versions of the dataset stored on SCA servers. The original national WBD served from the GDW should be moved to an archive folder and renamed wbdhu8_l <xx>av1, wbdhu8_a <xx>av1, wbdhu12_l <xx>av1, wbdhu12_a <xx>av1 as above example. The national data steward will maintain two previous copies of the original data set online and indefinite copies on storage media. The metadata should be updated to reflect the date and other particulars about how and why it was archived.